

## **QPF Process Implementation Time Line: Deadlines, Tasks, and Action Office/Region**

Completion of the specified tasks will ensure implementation by 30 September 2000 of the recommendations adopted at the August 1999 Director's Conference and the supporting recommendations outlined in the QPF Process Assessment Team Report.

### **Completed Tasks**

#### **September 1999**

September 1: Submit coordinated AWIPS Build 5 QPF Requirements White Paper (RWP00059) to APO specifying functionality necessary to implement a uniform AWIPS QPF tool which satisfies existing HPC, RFC, and WFO requirements. Action: OM

September 15: Submit proposal to NCEP Director for HPC FTE reallocation to improve QPF support for hydrologic services. Action: NCEP/HPC

#### **October 1999**

October 1: Determine Level of Effort (LOE) in (development) months required to implement critical QPF functionality in AWIPS Builds 5. Action: OM and APO

October 1: Submit requirements to NCEP Central Operations (NCO) for NMAP software enhancements for HPC QPF product development. Action: NCEP/HPC

October 1: Coordinate with Western Region to standardize the format of the HPC-generated QPF point forecasts provided to CONUS RFCs west of the Continental Divide. Action: NCEP/HPC

October 8: Approval by FRG of course agendas for RFC HAS/HPC QPI Workshops and SOO Heavy Precipitation and Flash Flood Symposia at COMET. Action: OM and OH

October 15: Specify new HPC product suite and delivery schedule (satisfying QPF Assessment Team Report recommendations and QPI Plan requirements). Action: NCEP/HPC and OM

October 20: Submit request to Data Review Group (DRG) to approve dissemination of new graphical Phase 1 (of 2) (see attached tables) HPC QPF products via AWIPS. Action: NCEP/HPC

October 20: Issue Public Notification Statement (PNS) for HPC Phase 1 product suite enhancements (enhancements effective 1200 UTC cycle 6 December 1999). Action: OM

October 29: Approve reallocation of internal HPC FTEs. Action: NCEP

October 29: Complete preparations for data access, archival, and analysis to support verification of HPC and WFO QPFs generated during the WR follow-on assessment. Action: OM

October 29: Approve time line or respond with comments for the implementation of the recommendations adopted at the August 1999 Director's Conference and the supporting recommendations outlined in the QPF Process Assessment Team Report. Action: Corporate Board

October 29: Approve verification methodology and evaluation criteria or respond with comments for WR follow-on assessment. Action: Corporate Board

October 29: Implement procedure to provide 6-h point QPFs through Day 3 for WR. Action: NCEP/HPC

### **November 1999**

November 1: Begin WR Follow-on Assessment. Action: OM, NCEP, WR

November 1: Obtain DRG approval for transmission of new graphical (Phase 1) HPC QPF products via AWIPS. Action: OSO

November 3: Disseminate revised implementation time line and WR Follow-on Assessment verification methodology and evaluation criteria to Corporate Board. Action: OM

November 10: Approve revised implementation time line and WR Follow-on Assessment verification methodology and evaluation criteria. Action: Corporate Board

### **Future Tasks**

November 30: Map into the Build 5 Plan development tasks necessary to prototype a uniform AWIPS QPF tool to replace legacy software applications at RFCs, NCEP, and WFOs. Assess impact on other currently planned AWIPS Build 5 tasks. Action: APO

November 30: Implement approved internal HPC FTE reallocation and notify all internal and external customers via PNS of any service impacts. Action: NCEP

November 30: Host 3-day meeting (commencing 30 Nov) wherein representatives from the affected regions, NCEP, OH, APO, and OSO work as a team reviewing, focusing, and addressing all necessary implementation issues. Travel costs will be covered by attendees. Action: OM

### **December 1999**

December 2: Reach consensus on standard RFC software application and format for HPC-generated QPF grids. Action: ER/CR/SR/OH

December 2: If HASQPF is selected to continue as the standard software application used by RFCs east of the Continental Divide, make commitment to support and maintain the RFC HASQPF software application beginning April 3, 2000. If APO adapts and maintains a current AWIPS grid editing tool for use at the RFCs east of the Continental Divide, make commitment to assume responsibility for integration of this grid editor at the affected RFCs. If some other yet-to-be-developed RFC or HRL grid editor is the consensus choice, make commitment to assume responsibility for the integration and maintenance of this grid editor. Action: OH

December 6: Implement Phase 1 HPC product suite enhancements. Action: NCEP/HPC

December 15: Post WR QPF Follow-on Assessment verification results for the month of November on web site. Action: OM

December 15: Submit request to DRG to approve dissemination of new gridded, graphical, and text (Phase 2) HPC QPF products via AWIPS (Phase 2 product suite enhancements are planned for implementation effective 1200 UTC cycle 31 May 2000). Action: NCEP/HPC

December 23: Each Region and Office Director will provide the CFO FY00 and FY01 resource assessment/impacts for implementation of modified QPF process. Action: Each Region and Office

### **January 2000**

January 14: CFO responds to each Office and Regional Director on FY00 and FY01 resource request and begins coordination with NWSEO regarding operational changes. Action: CFO

January 18: Post WR QPF Follow-on Assessment verification results for the month of December on web site. Action: OM

January 20: Prepare an analysis of the projected FY02 personnel and funding impacts of the revised QPF Process and if necessary submit FY02 budget information to the CFO. Action: Each Region and Office

January 28: Implement WFO and RFC AWIPS functionality (patch) to recognize, store, and display new (Redbook) graphical (Phase 1) HPC QPF products. Action: APO

### **February 2000**

February 4: Reach consensus, in coordination with OM and OH, on a standard format for archiving RFC QPE and HAS-modified QPF grids necessary for the implementation of a National Precipitation Verification Unit (NPVU). Action: CR/WR/ER/SR

February 16: Post WR QPF Follow-on Assessment verification results for the month of January on web site. Action: OM

February 18: Submit request to DRG to approve dissemination of new RFC HAS QPF products to associated WFOs via AWIPS (product format determined at NWSH meeting December 2, 1999). Action: OH

February 22: Ensure WFO and RFC staffs understand the impact of the QPF process modifications, approved at the August 25 Director's Meeting, on operations. Action: CR/ER/SR

February 25: Provide status update to Corporate Board. Action: OM

### **March 2000**

March 15: Obtain DRG approval for transmission of new gridded, graphical, and text (Phase 2) HPC QPF and RFC QPE and QPF products via AWIPS SBN/WAN. Action: OSO

March 15: Post WR QPF Follow-on Assessment verification results for the month of February on web site. Action: OM

March 28: Demonstrate for OH, OM, Regions, and NCEP, transmission of new HPC and RFC products via AWIPS SBN/WAN. Action: APO

March 30: At current WFO IFPS Alpha Sites, and in support of June-July 2000 OT&E, implement AWIPS functionality (patch) to display HPC and RFC QPF products and generate a gridded QPF and accompanying QPS (text) product. [Note: Resources are currently not available given Build 5.0 deadlines to initialize WFO grid editor with RFC or HPC gridded QPF products.] Action: APO

March 30: Implement, if necessary (as determined at NWSH meeting December 2, 1999), AWIPS QPF grid conversion software (e.g., conversion from HASQPF GRIB format to AWIPS format for transmission to WFO and NPVU). [Note: Provision of this capability is contingent upon the availability of additional resources. A grid conversion capability is required if WFOs are provided with the capability to initialize the AWIPS grid editor with RFC or HPC gridded QPF products *and* HASQPF continues as the software application used by RFCs east of the Continental Divide.] Action: APO

March 31: Complete data gathering for WR follow-on assessment. Action: OM

### **April 2000**

April 3: Assume responsibility for field support and maintenance of the RFC HASQPF software application *or* assume responsibility for integration of an AWIPS grid editor at RFCs east of Continental Divide *or* assume responsibility for the integration and maintenance of other (yet-to-be-developed) grid editor (specific responsibility contingent on software application selected December 2, 1999). Action: OH

April 5: Issue Public Notification Statement (PNS) for HPC Phase 2 product suite enhancements (enhancements effective 1200 UTC cycle 31 May 2000). Action: OM

April 7: Provide status update to Corporate Board. Action: OM

April 12: Validate transmission of new HPC and RFC products via AWIPS SBN/WAN. Action: NCEP/SR/ER/CR/WR

April 14: Implement HPC NAWIPS (NMAP) software enhancements to generate gridded products. Action: NCEP/NCO

April 14: Post WR QPF Follow-on Assessment verification results for the month of March and 5-month summary on web site. Action: OM

April 18: Reconvene QPF Process Assessment Team to review the WR Follow-on Assessment verification results. Action: OM

April 19: Ensure RFC capability exists for the short-term archival at RFCs of gridded HPC and RFC QPF products and gridded RFC QPE products. Action: OH

April 28: Complete on-station staff training on NWSRFS. Action: NCEP/HPC

April 28: Complete, in coordination with OM and OH, consensus plan for two-month OT&E for modified QPF process. Action: CR/SR/ER/WR/NCEP

### **May 2000**

May 1: Complete and test backup procedures for the HPC QPF products. Action: NCEP

May 1: Establish QPF backup procedures for the RFC HAS QPF products. Action: OH

May 1: Implement internal procedures, in coordination with the CONUS Regions, for RFCs to request updates of HPC QPF guidance products. Action: NCEP

May 17: Conduct Corporate Board VTC to decide on QPF process west of Continental Divide. The QPF Process Assessment Team Leader will present the results of the WR Follow-on Assessment and provide a recommendation based upon a business-case analysis to Corporate Board. Action: OM/Corporate Board

May 31: Implement Phase 2 HPC products suite enhancements. Action: NCEP

May 31: Implement procedures for coordination of QPFs between HPC and RFCs (to include point-to-multipoint "blast-up" teleconferencing -- phone charges for HPC-initiated calls will be funded by NCEP). Action: NCEP

May 31: Implement updated internal regional procedures for coordination of HAS-generated QPFs and river forecast guidance between RFCs and WFOs. Action: ER/CR/SR/WR

### **June 2000**

June 1: Begin two-month OT&E for modified QPF process. Action: NCEP/CR/SR/ER

June 1: Begin routine provision of gridded and point ground truth (QPE) and HAS QPF products to WFOs and NPVU. Action: CR/ER/SR/WR

June 15: Begin two-month OT&E for NPVU. Action: OM

June 30: Implement, via AWIPS Build 5.0, functionality for WFOs to display HPC and RFC QPF products and generate a gridded QPF and accompanying QPS (text) product. Action: APO

### **July 2000**

July 31: Complete two-month OT&E for modified QPF process. Action: NCEP/CR/SR/ER

July 31: Coordinate with FTS service providers to ensure that an audio teleconferencing capability will continue to be available in December 2000. Action: OM

### **August 2000**

August 7: Reaffirm the impact of the revised QPF process on staffing and funding needs for the CFO and, if necessary, recommend FY01 budget related actions. Action: Each Region and Office

August 15: Complete two-month OT&E for NPVU. Action: OM

August 21: Begin SOO Heavy Precipitation and Flash Flood Symposia at COMET with workshop materials also available on the world wide web to support on-station training.. Action: OM

### **September 2000**

September 1: Begin transition to modified QPF Process. Action: NCEP/ER/CR/SR

September 7: Provide Corporate Board summary of 2-month modified QPF Process and NPVU OT&Es and associated actions. Action: OM

September 15: Issue updated WSOM Chapters. Action: OH

September 27: Complete transition to modified QPF Process. Action: NCEP/ER/CR/SR

September 29: Implement NPVU, confirm commitment to maintain, and begin routine archival and verification QPF products and provision of verification feedback to forecasters, model developers, and management. Action: OM

### **October 2000**

October 2: Begin RFC HAS/HPC QPI Workshops at COMET with workshop materials also available on the world wide web to support on-station training. Action: OM

### **November 2000**

November 17: Complete RFC HAS/HPC QPI Workshops at COMET. Action: OM

November 30: If necessary, ensure conversion of audio teleconferencing capability to FTS2001

provider is complete. Action: NCEP

### **January 2001**

January 31: Begin evaluation of prototype uniform AWIPS QPF tool which satisfies existing HPC, RFC, and WFO requirements (RWP00059) and allows for replacement of legacy software. Action: APO

### **March 2001**

March 16: Complete SOO Heavy Precipitation and Flash Flood Symposia at COMET. Action: OM

### **July 2001**

July 31: Complete evaluation of prototype of uniform AWIPS QPF tool which satisfies existing HPC, RFC, and WFO requirements (RWP00059) and allows for replacement of legacy software. Action: APO

### **January 2002**

January 31: Pending evaluation results, implement uniform AWIPS QPF tool nationwide at NCEP, RFCs, and WFOs and replace legacy software. Action: APO

# **Follow-On Western Region Assessment**

## **Comparative Verification**

### **Perform verification analysis for both the CNRFC and NWRFC**

### **Utilize approach consistent with that employed by the QPF Process Assessment Team**

- Conduct assessment over 5-mo period from 1 November 1999 to 31 March 2000
- Utilize OM-funded UCAR Visiting Scientist to compute verification statistics
- Employ prototype of nationally-approved verification program
- Compute 6- and 24-h verification statistics for
  - 1) each month
  - 2) for the entire 5-month test period
- Assess relative skill HPC and WFOs (statistical guidance products will not be verified)
- Verification statistics will be computed
  - 1) for the full range of precipitation amounts
  - 2) for discrete precipitation (p) intervals (e.g.,  $.01'' \leq p < .25''$ ,  $.25'' \leq p < .50''$ ,  $.50'' \leq p < 1.00''$ ,  $1.00'' \leq p < 2.00''$ , and  $p \geq 2.00''$ ) based upon a) observed amounts and b) observed and forecasts amounts combined
- Utilize Mountain Mapper generated grids (and quality-controlled point observations) as ground truth
- Compute verification statistics for gridded products on 32-km grid (for both the CNRFC and NWRFC domains)
  - 1) QPF products will be mapped to a 32-km grid
  - 2) Validation data on 4 km (HRAP) grid will be remapped to a 32-km grid
- Assess skill using same comprehensive set of hydrologically relevant measures (skill measures included: Mean Absolute Error, Bias, Mean Error, Root Mean Squared Error, Reduction of Variance, Correlation Coefficient, Threat Score, Equitable Threat Score, and Heidke Skill Score)

### **Employ enhancements to successful QPF Process Assessment Team approach**

- Include Days 1 through 3
  - 1) only Day 1 QPFs were evaluated by the QPF Process Assessment Team
  - 2) HPC 6-h Day 2 and Day 3 QPFs for CNRFC will be available beginning 6 December 1999
  - 3) 6- and 24-h verification statistics will be computed individually for Day 1, Day 2, and Day 3
- Perform gridded and point verification (for pre-specified WR forecast points)
- Compare scheduled HPC and WFO products only (to ensure a fair comparison, updated QPFs *will not be included* in the verification sample)



## **Decision Process**

### **Employ the following guideline:**

- Utilize Mean Absolute Error (MAE) as benchmark for assessing skill of gridded and point QPFs (MAE was utilized as benchmark by QPF Process Assessment team)

### **Utilize the following decision criteria:**

If the overall skill comparison reveals that:

HPC > WFO and skill differences are clear-cut, relieve CONUS WFOs west of the Continental Divide of the requirement to produce QPF for input to NWSRFS beginning October 2000.

HPC < WFO and skill differences are important and clear-cut, then the WFOs west of the Continental Divide retain the requirement to produce QPF for input to NWSRFS.

If skill differences between HPC and WFOs are nearly equal or not clear-cut, examine other relevant factors (i.e., the cost of the production and delivery of the QPF forecasts to the RFCs, apparent impact of the skill differences), and make a business case judgement of the best course of action.

Reconvene the QPF Process Assessment Team to review the verification results and make a recommendation to the Corporate Board.

Attachments: Table 1 (Current HPC QPF products) and Table 2 (Enhanced HPC QPF products)

<b>Table 1: Current HPC CONUS Forecast and Guidance Products and Issuance Times</b>			
<b>Issuance Time (UTC)</b>	<b>Valid Time (UTC)</b>	<b>Product ID (AWIPS Header for gridded products TBD)</b>	<b>Product Description * Winter Issuance Only ** Product Issued if Necessary (Special Rainfall Discussion [QPF SRD] issued as needed)</b>
0000	0000 - 0600	91E	0 - 6 h liquid equivalent QPF
0215	0600 - 1200 1200 - 1800 0600 - 1800 1800 - 0600 0300 - 1200	92E 93E 93S 94S 94E	4 - 10 h QPF 10 - 16 h QPF 4 - 16 h Heavy Snow Forecast (4" contours)* 16 - 28 h Heavy Snow Outlook* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time**
0300	0600 - 0600 0300 - 1200	QPFHSD QPFERD	Heavy Snow Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E**
0600	0600 - 1200	91E	0 - 6 h liquid equivalent QPF
0615	1200 - 1800 1800 - 0000 1200 - 1200 1200 - 0000 0000 - 1200 1200 - 1200	92E 93E 94Q 93S 94S 94E	6 - 12 h QPF 12 - 18 h QPF 6 - 30 h (Preliminary Day 1) QPF 6 - 18 h Heavy Snow Forecast (4" contours)* 18 - 30 h Heavy Snow Outlook* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time
0700	1200 - 1200 1200 - 1200 1200 - 1200	QPF PFD QPFHSD QPFERD	Discussion accompanying 94Q Heavy Snow Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E
0830	1200 - 1200	98Q	27.5 - 51.5 h (Day 2) QPF
1015	1200 - 1800 1800 - 0000 0000 - 0600 0600 - 1200 1200 - 1200	92E 93E 9EE 9FE 94Q	2 - 8 h QPF 8 - 14 h QPF 14 - 20 h QPF 20 - 26 h QPF 2 - 26 (Final Day 1) h QPF
1100	1200 - 1200	QPF PFD	Discussion accompanying 94Q and 98Q
1200	1200 - 1800	91E	0 - 6 h liquid equivalent QPF
1415	1800 - 0000 0000 - 0600 1800 - 0600 0600 - 1800 1500 - 1200	92E 93E 93S 94S 94E	4 - 10 h QPF 10-16 h QPF 4 - 16 h Heavy Snow Forecast (4" contours)* 16 - 28 h Heavy Snow Outlook* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time
1500	1800 - 1800 1500 - 1200	QPFHSD QPFERD	Heavy Snow Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E
1800	1800 - 0000	91E	0 - 6 h liquid equivalent QPF
1815	0000 - 0600 0600 - 1200 1200 - 1800 1800 - 0000 1200 - 1200 0000 - 1200 1200 - 0000 2100 - 1200	92E 93E 9EE 9FE 98Q 93S 94S 94E	6 - 12 h QPF 12 - 18 h QPF 18 - 24 h QPF 24 - 30 h QPF 18 - 42 h (Day 2 Update) QPF 6 - 18 h Heavy Snow Forecast (4" contours)* 18 - 30 h Heavy Snow Outlook* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time
1900	1200 - 1200 0000 - 0000 2100 - 1200	QPF PFD QPFHSD QPFERD	Discussion accompanying 98Q Heavy Snow Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E

<b>Table 2: Modernized HPC CONUS Forecast and Guidance Products and Issuance Times</b> <b>Enhancements will be implemented in Two Phases</b> <i>Phase 1 enhancements effective 1200 UTC cycle 6 December 1999 (depicted in blue below)</i> <i>Phase 2 enhancements effective 1200 UTC cycle 31 May 2000 (depicted in red below)</i> <b>Note: Isohyetal analyses will start at 0.01" (measurable precipitation) instead of one-quarter inch to improve support for hydrologic services</b>			
<b>Issuance Time (UTC)</b>	<b>Valid Time (UTC)</b>	<b>Product ID (AWIPS Header for gridded products TBD)</b>	<b>Product Description * Winter Issuance Only (Special Rainfall Discussion [QPF SRD] issued as needed) ** west of Continental Divide and only during Oct 15 - Apr 15</b>
0215	0600 - 1800 1800 - 0600 0300 - 0000	93S graphic 94S graphic 94E graphic	4 - 16 h Probabilistic Heavy Snow/Icing Forecast* 16 - 28 h Probabilistic Heavy Snow/Icing Forecast* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time
0300	0600 - 0600 0300 - 0000	QPFHSD QPFERD	Heavy Snow/Icing Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E
0600	0600 - 1200	91E graphic & grid	0 - 6 h liquid equivalent QPF
0615	1200 - 1200 1200 - 0000 0000 - 1200 1200 - 1200	94Q graphic 93S graphic 94S graphic 94E graphic	Preliminary 6 - 30 h (Day 1) QPF 6 - 18 h Probabilistic Heavy Snow/Icing Forecast* 18 - 30 h Probabilistic Heavy Snow/Icing Forecast* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time
0700	1200 - 1200 1200 - 1200 1200 - 1200 1200 - 1200	QPFPPD 98Q graphic QPFERD 98S graphic	Discussion accompanying 94Q Preliminary 29 - 53 h (Day 2) QPF Excessive Rainfall Discussion accompanying the 94E 29 - 53 h Probabilistic Heavy Snow/Icing Outlook*
0745	1200 - 1200	QPFHSD	Heavy Snow/Icing Discussion accompanying the 93S, 94S, and 98S*
1015	1200 - 1800 1800 - 0000 0000 - 0600 0600 - 1200 1200 - 1200 1200 - 1800 1800 - 0000 0000 - 0600 0600 - 1200 1200 - 1200 1200 - 1800 1800 - 0000 0000 - 0600 0600 - 1200 1200 - 1200 1200 - 1800, 1800 - 0000, 0000 - 0600, and 0600 - 1200	92E graphic & grid 93E graphic & grid 9EE graphic & grid 9FE graphic & grid 94Q graphic 9GE graphic & grid 9HE graphic & grid 9IE graphic & grid 9JE graphic & grid 98Q graphic 9KE graphic 9LE graphic 9ME graphic 9NE graphic 99Q graphic & grid points	2 - 8 h QPF 8 - 14 h QPF 14 - 20 h QPF 20 - 26 h QPF Final 2 - 26 h (Day 1) QPF 26 - 32 h QPF 32 - 38 h QPF 38 - 44 h QPF 44 - 50 h QPF Final 26 - 50 h (Day 2) QPF 50 - 56 h QPF** 56 - 62 h QPF** 62 - 68 h QPF** 68 - 74 h QPF** 50 - 74 h (Day 3) QPF 2 - 74 (Days 1-3) 6 -h QPF for WR forecast points (only during Oct 15 - Apr 15)
1100	1200 - 1200	QPFPPD	Discussions accompanying 94Q, 98Q, and 99Q
1415	1800 - 0600 0600 - 1800 1500 - 1200	93S graphic 94S graphic 94E graphic	4 - 16 h Probabilistic Heavy Snow/Icing Forecast* 16 - 28 h Probabilistic Heavy Snow/Icing Forecast* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time

**Table 2: Modernized HPC CONUS Forecast and Guidance Products and Issuance Times - Continued**

**Enhancements will be implemented in Two Phases**

**Phase 1** enhancements effective 1200 UTC cycle 6 December 1999 (depicted in **blue** below)

**Phase 2** enhancements effective 1200 UTC cycle 31 May 2000 (depicted in **red** below)

*Note: Isohyetal analyses will start at 0.01" (measurable precipitation) instead of one-quarter inch to improve support for hydrologic services*

<b>Issuance Time (UTC)</b>	<b>Valid Time (UTC)</b>	<b>Product ID (AWIPS Header for gridded products TBD)</b>	<b>Product Description * Winter Issuance Only (Special Rainfall Discussion [QPF SRD] issued as needed) ** west of Continental Divide and only during Oct 15 - Apr 15</b>
1500	1800 - 1800 1500 - 1200	QPFHSD QPFERD	Heavy Snow/Icing Discussion accompanying the 93S and 94S* Excessive Rainfall Discussion accompanying the 94E
1800	1800 - 0000	91E graphic & grid	0 - 6 h liquid equivalent QPF
1815	0000 - 0000 0000 - 1200 1200 - 0000 0000 - 0000 1200 - 1200	94Q graphic 93S graphic 94S graphic 94E graphic 95E graphic & grid	Preliminary 6 - 30 h (Day 1) QPF 6 - 18 h Probabilistic Heavy Snow/Icing Forecast* 18 - 30 h Probabilistic Heavy Snow/Icing Forecast* Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5" during forecast valid time 114 h Day 1 through 5 (120 h total) QPF
1900	0000 - 0000 0000 - 0000 0000 - 0000 0000 - 0000	QPF PFD 98Q graphic QPFERD 98S graphic	Discussion accompanying 94Q Preliminary 29 - 53 h (Day 2) QPF Excessive Rainfall Discussion accompanying the 94E 29 - 53 h Probabilistic Heavy Snow/Icing Outlook*
1945	0000 - 0000	QPFHSD	Heavy Snow/Icing Discussion accompanying the 93S, 94S, and 98S*
2215	0000 - 0600 0600 - 1200 1200 - 1800 1800 - 0000 0000 - 0000 0000 - 0600 0600 - 1200 1200 - 1800 1800 - 0000 0000 - 0000 0000 - 0600 0600 - 1200 1200 - 1800 1800 - 0000 0000 - 0000 0000 - 0600 0600 - 1200 1200 - 1800 1800 - 0000 0000 - 0000 0000 - 0600, 0600 - 1200, 1200 - 1800, and 1800 - 0000	92E graphic & grid 93E graphic & grid 9EE graphic & grid 9FE graphic & grid 94Q graphic 9GE graphic & grid 9HE graphic & grid 9IE graphic & grid 9JE graphic & grid 98Q graphic 9KE graphic 9LE graphic 9ME graphic 9NE graphic 99Q graphic & grid points	2 - 8 h QPF 8 - 14 h QPF 14 - 20 h QPF 20 - 26 h QPF Final 2 - 26 h (Day 1) QPF 26 - 32 h QPF 32 - 38 h QPF 38 - 44 h QPF 44 - 50 h QPF Final 26 - 50 h (Day 2) QPF 50 - 56 h QPF** 56 - 62 h QPF** 62 - 68 h QPF** 68 - 74 h QPF** 50 - 74 h (Day 3) QPF 2 - 74 (Days 1-3) 6 -h QPF for WR forecast points (only during Oct 15 - Apr 15)
2300	0000 - 0000	QPF PFD	Discussions accompanying 94Q, 98Q, and 99Q